

**NEI 10-05 [Revision 0]**

# **Assessment of On-Shift Emergency Response Organization Staffing and Capabilities**

**November 2010**

[THIS PAGE IS LEFT BLANK INTENTIONALLY]

**NEI 10-05 [Revision 0]**

**Nuclear Energy Institute**

**Assessment of On-Shift  
Emergency Response  
Organization Staffing  
and Capabilities**

**November 2010**

## **ACKNOWLEDGEMENTS**

This document was developed by the Nuclear Energy Institute (NEI) On-shift Emergency Response Organization (ERO) Staffing Analysis Task Force.

### **NEI On-Shift ERO Staffing Analysis Task Force**

Keith Kemper, Exelon Nuclear

Scott McCain, Emergency Planning Technical Consultants, Inc.

David Young, NextEra Energy Seabrook Station, LLC

Martin Hug, Nuclear Energy Institute

## **NOTICE**

Neither NEI, nor any of its employees, members, supporting organizations, contractors, or consultants make any warranty, expressed or implied, or assume any legal responsibility for the accuracy or completeness of, or assume any liability for damages resulting from any use of, any information apparatus, methods, or process disclosed in this report or that such may not infringe privately owned rights.

## **EXECUTIVE SUMMARY**

A nuclear power plant's on-shift Emergency Response Organization (ERO) staff must be capable of implementing the site emergency plan to address a spectrum initiating events and consequences. Key emergency response functions and tasks are described in NUREG-0654, and include:

- Shutdown the reactor and maintain safe shutdown
- Mitigate event consequences
- Notify augmented ERO staff and Offsite Response Organizations (OROs)
- Determine Protective Action Recommendations (PARs) for site personnel and the public
- Perform firefighting
- Provide medical assistance if needed

The on-shift ERO staff must not be assigned additional responsibilities that could detract from the performance of their primary emergency plan functions.

Section IV.A.9 of 10 CFR 50, Appendix E, states that "Nuclear power reactor licensees shall perform a detailed analysis demonstrating that on-shift personnel assigned emergency plan implementation functions are not assigned responsibilities that would prevent the timely performance of their assigned functions as specified in the emergency plan." The NEI On-shift ERO Staffing Task Force has developed this document to establish a standard methodology for performing analyses of the ability of on-shift staff to perform all required functions and tasks necessary to respond to a declared emergency. Licensees may use this methodology to meet the requirement of 10 CFR 50, Appendix E, Section IV.A.9 in a manner acceptable to the US Nuclear Regulatory Commission (NRC) staff.

A licensee may modify the methodology described in this document, or employ an alternate staffing analysis approach, if it is determined that the methodology is not the optimum for assessing their particular circumstances. For example, there are site-specific staffing, response commitments or technology factors that the methodology does not adequately consider. The modified methodology or alternate approach must be consistent with NRC requirements.

The staffing analyses performed in accordance with this document are not part of the site's emergency plan and are not subject to the requirements of 10 CFR 50.54(q); however, any proposed changes to staffing levels described in the emergency plan are subject to the requirements of 10 CFR 50.54(q). Although there are no regulatory submittal requirements associated with staffing analyses, they must be retained and available for regulatory inspection. The analyses should be updated as needed to address changes in shift staffing, assignment of key responsibilities, facilities or equipment, etc.

[THIS PAGE IS LEFT BLANK INTENTIONALLY]

## **TABLE OF CONTENTS**

|  |           |
|--|-----------|
| <b>EXECUTIVE SUMMARY.....</b>  | <b>i</b>  |
| <b>1 REGULATORY BACKGROUND DISCUSSION .....</b>  | <b>1</b>  |
| <b>2 METHODOLOGY OVERVIEW.....</b>   | <b>2</b>  |
| 2.1 ANALYSIS PROCESS DESCRIPTION.....  | 2         |
| 2.2 DESIGN BASIS ACCIDENTS .....   | 3         |
| 2.3 ON-SHIFT STAFF.....  | 4         |
| 2.4 AUGMENTED ERO RESPONSE TIME.....   | 4         |
| 2.5 CHANGES TO ERO RESPONSE TIMES .....  | 4         |
| FIGURE 2.1 .....   | 5         |
| <b>3 COLLATERAL DUTY IDENTIFICATION ANALYSIS .....</b>   | <b>6</b>  |
| 3.1 ASSUMPTIONS AND LIMITATIONS .....  | 6         |
| 3.2 INSTRUCTIONS .....   | 8         |
| <b>4 TIME TASK ANALYSIS PROCESS.....</b>   | <b>17</b> |
| 4.1 PROCESS ASSUMPTIONS .....  | 17        |
| 4.2 PROCESS OUTLINE.....   | 18        |
| <b>5 REFERENCES.....</b>   | <b>20</b> |
| 5.1 10 CFR § 50.54 CONDITIONS OF LICENSES – SECTION (M).....   | 20        |
| 5.2 NUREG/CR-3903, ANALYSIS OF EMERGENCY STAFFING FOR NUCLEAR POWER<br>PLANTS 20   |           |
| 5.3 NUREG-0654, CRITERIA FOR PREPARATION AND EVALUATION OF RADIOLOGICAL<br>EMERGENCY RESPONSE PLANS AND PREPAREDNESS IN SUPPORT OF NUCLEAR<br>POWER PLANTS ..... | 20        |
| 5.4 NUREG-0800, STANDARD REVIEW PLAN FOR THE REVIEW OF SAFETY ANALYSIS<br>REPORTS FOR NUCLEAR POWER PLANTS.....  | 20        |
| 5.5 NUREG-1852, DEMONSTRATING THE FEASIBILITY AND RELIABILITY OF OPERATOR<br>MANUAL ACTIONS IN RESPONSE TO FIRE .....  | 20        |
| 5.6 NRC INFORMATION NOTICE 91-77, SHIFT STAFFING AT NUCLEAR POWER PLANTS   | 20        |
| 5.7 NRC INFORMATION NOTICE 93-81, IMPLEMENTATION OF ENGINEERING EXPERTISE<br>ON-SHIFT .....  | 20        |
| 5.8 NRC INFORMATION NOTICE 95-48, RESULTS OF SHIFT STAFFING STUDY .....  | 20        |

|  |            |
|--|------------|
| <b>5.9 INPO SIGNIFICANT OPERATING EXPERIENCE REPORT 96-1, CONTROL ROOM<br/>SUPERVISION, OPERATIONAL DECISION-MAKING, AND TEAMWORK.....</b> | <b>20</b>  |
| <b>APPENDIX A.....</b>   | <b>A-1</b> |
| <b>APPENDIX B.....</b>   | <b>B-1</b> |
| <b>APPENDIX C.....</b>   | <b>C-1</b> |
| <b>APPENDIX D.....</b>   | <b>D-1</b> |
| <b>APPENDIX E.....</b>   | <b>E-1</b> |
| <b>APPENDIX F.....</b>   | <b>F-1</b> |

## **ASSESSMENT OF ON-SHIFT EMERGENCY RESPONSE ORGANIZATION STAFFING AND CAPABILITIES**

### **1 REGULATORY BACKGROUND DISCUSSION**

The specific requirement for establishing a shift emergency organization to respond to emergency events appears in 10 CFR 50.47(b)(2) which states, in part, the following:

*On-shift facility licensee responsibilities for emergency response are unambiguously defined, adequate staffing to provide initial facility accident response in key functional areas is maintained at all times...*

Additionally, 10 CFR Part 50, Appendix E, Section IV.A, requires licensees to describe the organization for coping with radiological emergencies, including individuals assigned to the licensee's ERO with a description of emergency assignments.

NUREG-0654, Section II.B, "Onsite Emergency Organization," presents guidance for meeting these requirements. The guidance describes the onsite emergency organization, including the staffing requirements found in Table B-1, "Minimum Staffing Requirements for NRC Licensees for Nuclear Power Plant Emergencies." This table specifies a minimum of 10 on-shift responders in four functional areas. It also specifies 7 on-shift responders who perform response duties that may be performed by shift personnel who are assigned other functions. In other words, there are no dedicated responders to perform these functions. Finally, Table B-1 specifies two major functional areas, firefighting and site access control/personnel accountability, which must be staffed on a site-specific basis.

NUREG-0654, Section II.B, states that the emergency plan should unambiguously define on-shift responsibilities for emergency response. Specifically, Evaluation Criterion B.1 states that each licensee shall specify the onsite emergency organization of plant staff for all shifts and its relation to the responsibilities and duties of the normal staff complement. To meet this criterion, all licensees have an emergency plan that specifies each emergency function and the emergency position assigned to perform it. Emergency response staffing should consider such contingencies as activation of the fire brigade, back-shift staffing when overall staffing levels are lowest, and the potential demand for radiation protection and chemistry technicians during events involving radiological hazards.

The on-shift staff must be able to cope with a Design Basis Accident (DBA) or the Design Basis Threat (DBT) until augmenting Emergency Response Organization (ERO) staff arrives in accordance with the site's emergency plan commitments. The augmented ERO responders assume many managerial, engineering, and administrative duties from the on-shift personnel, allowing them to focus more fully on plant operations. NUREG-0654 guidance recommends that there be 30-minute and 60-minute responders; however, many sites have different augmentation time commitments. This fact is recognized by the methodology described in NEI 10-05.

Although on-shift staff may have to deal with a severe reactor accident, including a core melt sequence, this type of event is highly unlikely. Consequently, licensees may limit the staffing analyses to the DBAs described in the plant licensing basis and the current DBT.

## **2 METHODOLOGY OVERVIEW**

### **2.1 ANALYSIS PROCESS DESCRIPTION**

The on-shift staff must be capable of performing all assigned emergency response actions in an effective and timely manner prior to the arrival of the augmented Emergency Response Organization (ERO) staff. In addition, on-shift staff members must not be assigned additional responsibilities (i.e., a collateral duty) that could detract from the performance of their primary emergency plan functions. The methodology described in this document provides a structured approach for assessing on-shift staffing and capabilities, and is composed of the following three steps.

1. Identification of the events and accidents for which staffing analyses are required. These events and accidents are defined and bounded by criteria presented in NSIR/DPR-ISG-01, Interim Staff Guidance – Emergency Planning for Nuclear Power Plants, and include the Design Basis Threat (DBT) and the Design Basis Accidents (DBAs) identified in the site's Final Safety Analysis Report (FSAR), as updated. An analysis will be performed for each DBA and a separate analysis for the DBT.

An analysis using two or more concurrent DBAs, or a DBA concurrent with the DBT, is not required. In addition, no analysis is necessary for postulated event or accident sequences not described in the updated FSAR.

2. Performance of a Collateral Duty Identification Analysis (CDIA) that will identify:
  - a. On-shift ERO positions which clearly have no conflicting collateral duty assignments – no additional analysis is required for these positions.
  - b. On-shift ERO positions which may have conflicting collateral duty assignments – a Time Task Analysis (TTA) will be required for each position to determine if the collateral duty assignments are acceptable.

The CDIA is described in Section 3.0 of this document.

3. Performance of a TTA Process if required by the CDIA. The TTA will determine if a position can perform each assigned activity in an effective and timely manner, consistent with applicable regulatory requirements and station commitments, until relieved by the augmenting ERO staff.

The TTA Process is described in Section 4.0 of this document.

An overview of the methodology described above is presented in Figure 2.1.

Following completion of an analysis, licensees are expected to promptly enter any unsatisfactory results into their Corrective Action Program for resolution.

## 2.2 DESIGN BASIS ACCIDENTS

The DBAs to be assessed are those described in the site's FSAR, as updated (also called an UFSAR), and which address the Postulated Accidents presented in Chapter 15, Transient and Accident Analysis, of NUREG-0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition. Sites with an UFSAR not conforming to chapter layout of NUREG-0800 (i.e., an older licensing basis) should use the analyzed DBAs that meet the definition of a Postulated Accident (see below).

The accident analysis section of an UFSAR describes the analyses for many different initiating events. Initiating events are categorized as either an Anticipated Operational Occurrence (AOO) or as a Postulated Accident. These two terms are described below.

AOO - The events that are categorized in Regulatory Guide 1.70 and in Regulatory Guide 1.206 as incidents of moderate frequency (i.e., events that are expected to occur several times during the plant's lifetime) and infrequent events (i.e., events that may occur during the lifetime of the plant). Incidents of moderate frequency and infrequent events are also known as Condition II and Condition III events, respectively, in commonly used, oft-cited but unofficial American Nuclear Society (ANS) standards.

During an AOO, fuel cladding integrity is maintained by ensuring that the minimum departure from nucleate boiling ratio (DNBR) remains above the 95/95 DNBR limit for Pressurized Water Reactors (PWRs) and that the critical power ratio (CPR) remains above the minimum critical power ratio (MCPR) safety limit for Boiling Water Reactors (BWRs). There is no possibility of initiating a postulated accident with the frequency of occurrence of an AOO. An AOO should not generate a postulated accident without other faults occurring independently, or result in a consequential loss of function of the RCS or reactor containment barriers.

Postulated Accident - Unanticipated occurrences that are postulated for accident analysis purposes but not expected to occur during the life of the plant. Postulated accidents are also known as Condition IV events in the unofficial ANS standards. Unlike an AOO, a postulated accident could result in sufficient damage to preclude resumption of plant operation. A Loss of Coolant Accident (LOCA) is an example of a Postulated Accident.

The following are some examples of Postulated Accidents in PWRs and BWRs of current designs:

- Major rupture of a pipe containing reactor coolant up to and including double-ended rupture of the largest pipe in the reactor coolant pressure boundary (PWR and BWR)
- Ejection of a control rod assembly (PWR)
- Control rod drop accident (BWR)
- Major secondary system pipe rupture up to and including double-ended rupture (PWR and BWR)
- Single reactor coolant pump locked rotor (PWR)
- Seizure of one recirculation pump (BWR)

From the above discussion, it can be seen that the potential consequences from a Postulated Accident are more severe than those associated with an AOO. As a result, a greater number and variety of actions would need to be implemented by plant personnel responding to Postulated Accident than those performed during an AOO. For this reason, staffing analyses are to be performed using DBA initiating events that are characterized as Postulated Accidents (or Condition IV events).

Some Postulated Accidents may be analyzed in several cases, each case reflecting different initial assumptions affecting radiological consequences (e.g., RCS activity, leak rate, etc.). For example, an analysis may contain a conservative case (e.g., a bounding case with parameters at Technical Specification allowable limits) and a realistic case (e.g., using typically expected parameters reflecting sound operational decision-making). The staffing analysis for that particular Postulated Accident may use the radiological consequences associated with the realistic case.

### **2.3 ON-SHIFT STAFF**

Only personnel required to be on-shift can be credited in a staffing analysis. The associated requirements may be the result of licensing basis commitments (e.g., Technical Specifications, Emergency Plan, etc.), or station programs and procedures. At a minimum, the number and composition of the on-shift staff must reflect the commitments within each site's emergency plan.

The analysis methodology allows flexibility in the assignment of on-shift response functions and tasks, dependent upon the event or accident. For example, members of a fire brigade may be assigned other response duties if the DBA does not include a fire. Likewise, a security officer might be assigned to perform offsite notifications during a DBA but not the DBT.

### **2.4 AUGMENTED ERO RESPONSE TIME**

Performance of a staffing analysis will require use of an assumed response (arrival) time for members of the augmented ERO. This time should be the maximum acceptable number of minutes elapsed between an emergency declaration<sup>1</sup> and the arrival of an ERO position-holder at a location necessary to relieve an on-shift ERO member. The times to be used are typically defined in, or can be derived from, the site emergency plan (e.g., in a description comparing augmented ERO staffing capability to NUREG 0654, Table B-1 guidance).

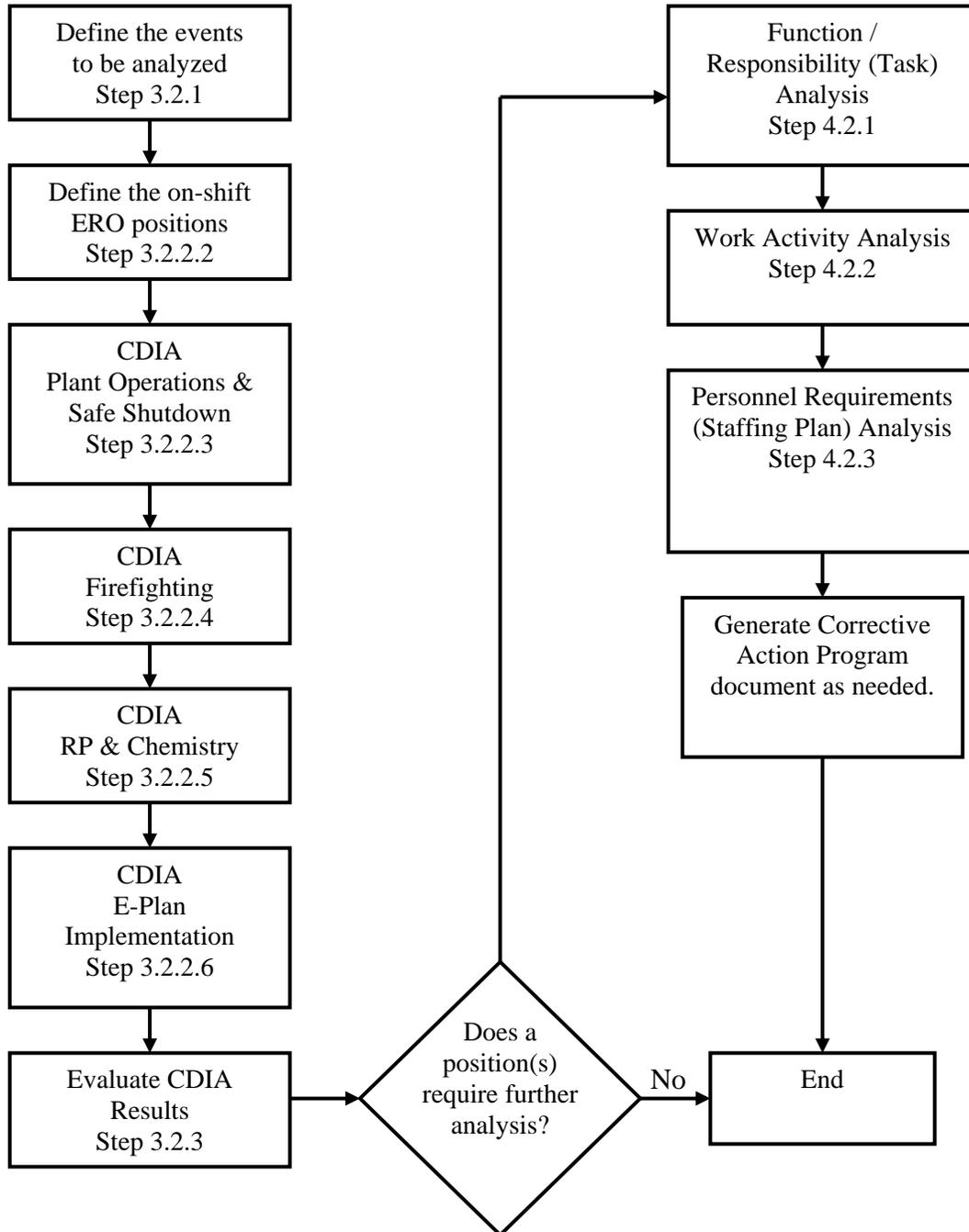
### **2.5 CHANGES TO ERO RESPONSE TIMES**

Licensees may wish to consider the benefits of using the staffing assessment methodology to evaluate proposed changes to on-shift staffing levels or augmented ERO response times. For example, an analysis could be performed with a desired response time for the augmenting ERO (e.g., 90 minutes). The results from this analysis may then be used to support the basis for changing a staffing or augmentation time commitment. As always, these types of changes are subject to the requirements of 10 CFR 50.54(q) and related guidance.

---

<sup>1</sup> An alternate start time may be used in specified in the site emergency plan.

**FIGURE 2.1**  
**Overview of On-Shift ERO Staffing Analysis Process**



### **3 COLLATERAL DUTY IDENTIFICATION ANALYSIS**

The on-shift assignments assessed by the Collateral Duty Identification Analysis (CDIA) include both the Major Functional Areas and Major Tasks listed in NUREG-0654, Table B-1, as well as additional actions identified by a review of related operating experience and regulatory documents. To facilitate the development of a standard and readily usable staffing assessment methodology, these functions and tasks were grouped into four major response areas.

- Plant Operations & Safe Shutdown
- Firefighting
- Radiation Protection & Chemistry
- Emergency Plan Implementation

The CDIA is meant to identify on-shift positions which have collateral duty assignments within two or more major response areas, and/or multiple function/task assignments within a single major response area such that effective overall performance could be challenged. These positions will require a Time Task Analysis (TTA) to determine if the duty assignments are acceptable, i.e., all actions can be performed in an effective and timely manner, consistent with applicable regulatory requirements and station commitments, until relieved by the augmenting ERO staff.

Additional process design considerations are discussed below.

#### **3.1 ASSUMPTIONS AND LIMITATIONS**

The following assumptions and limitations are applicable to all CDIA.

1. Unless otherwise specified by the initial conditions of a DBA analysis, it is assumed that all site units are in Mode 1, Power Operations, and operating at 100% reactor power.
2. The event being assessed occurs during off-normal work hours at a time when most ERO responders are not at the site (e.g., during a backshift, weekend or holiday). The ERO responders will need to be notified and report to their assigned locations.
3. The on-shift personnel complement is limited to the minimum required number and composition. If different situations could result in different minimum staffing levels (e.g., backshift vs. holiday vs. weekend, etc.), use the staffing with the smallest total number of personnel. Although the temporary absence of a position may be allowed by Technical Specifications, the analyses should be performed assuming that all required on-shift positions are filled.
4. With respect to the DBT staffing analyses, it may be assumed that a HOSTILE FORCE breached the Protected Area fence but was neutralized with no adverse consequences to plant safety. Damage inflicted on plant systems, structures and components is not sufficient to prevent safe shutdown or cause a radiological release. There is no fire significant enough to warrant firefighting efforts prior to the arrival of offsite resources

and/or the augmented ERO. The analysis should confirm that sufficient staff is available to simultaneously implement both the emergency plan and the security plan.

5. On-shift personnel can report to their assigned response locations within timeframes sufficient to allow for performance of assigned actions. Licensees should verify that the administrative controls necessary to promote a timely response by on-shift ERO personnel are in place.
6. The on-shift staff possesses the necessary Radiation Worker qualifications to obtain normal dosimetry and to enter Radiologically Controlled Areas (but not high, locked high or very high radiation areas) without the aid of a Radiation Protection (RP) Technician. Licensees should verify that the on-shift staff possesses the necessary qualifications.
7. Staffing requirements for operations personnel are established by NRC regulations and related guidance<sup>2</sup>. It is assumed that personnel assigned to the major response area of Plant Operations & Safe Shutdown meet these requirements and guidance, and are able to satisfactorily perform all functions and tasks necessary to achieve and maintain safe shutdown. Performance within this area is regularly analyzed through other station programs (e.g., licensed operator training) and will not be evaluated as part of this assessment, unless a role/function/task from another major response area is assigned as a collateral duty.

It is also assumed that performance of any “safety-related operator action”<sup>3</sup> will be done by a member of the shift operating crew defined in the unit’s Technical Specifications. This includes in-plant (manual) operator actions performed to manipulate components and equipment from locations outside the main control room, to achieve and maintain hot shutdown. These actions are typically performed by auxiliary (non-licensed) operators but may be performed by licensed operators under some conditions

8. Fire Brigade staffing requirements are established by NRC regulations and related guidance. It is assumed that personnel assigned to the major response area of Firefighting meet these requirements and guidance, and are able to satisfactorily perform all functions and tasks necessary to fight a fire. Performance within this area is regularly analyzed through other station programs (e.g., fire drills) and will not be evaluated as part of this assessment, unless a role/function/task from another major response area is assigned as a collateral duty.
9. The on-site security organization is able to satisfactorily perform all tasks related to Site and Protected Area Access Controls, under all DBA conditions. Performance of this function is regularly analyzed through other station programs (e.g., emergency response drills) and will not be evaluated here, unless a role or function from another major response area is assigned as a collateral duty.

---

<sup>2</sup> Principally 10 CFR 50.54(m) and NUREG-0800

<sup>3</sup> The American National Standards Institute/American Nuclear Society defined "safety-related operator action" in ANSI/ANS-58.8-1994, as follows: A manual action required by plant emergency procedures that is necessary to cause a safety-related system to perform its safety-related function during the course of any DBE (design-basis event). The successful performance of a safety-related operator action might require that discrete manipulations be performed in a specific order.

10. The task of making a simple and brief communication has minimal impact on the ability to perform other assigned functions/tasks, and therefore is an acceptable collateral duty for all positions. Examples include making a plant page announcement or placing a call for assistance to an offsite resource such as local law enforcement.
11. The task of performing a peer check has minimal impact on the ability to perform other assigned functions/tasks, and therefore is an acceptable collateral duty for all positions. Examples include performing a peer check on a recommended emergency classification or notification form for transmittal to offsite authorities.
12. Table B-1 of NUREG-0654 lists one Major Functional Area and one Major Task for which there may not be a need specified within a updated FSAR DBA analysis. These are “Repair and Corrective Actions” and “Rescue Operations and First Aid”. Likewise, their performance would not be required under the assumptions for the DBT analysis (see step 3.1.4 above).

Licensees should continue to use the guidance contained in NUREG-0654, Table B-1, concerning the assignment of these actions, i.e., they may be provided by shift personnel assigned other functions/tasks. It remains acceptable to assign the task of “Repair and Corrective Actions” and the function of “Rescue Operations and First Aid” as collateral duties to qualified personnel. The assignment of these responsibilities must be indicated within the site emergency plan consistent with NUREG-0654, Table B-1 and/or site-specific commitments.

To promote consistency across the industry in the assignment of the above function and task, the following definitions should be used unless site-specific definitions are already in place.

Repair and Corrective Actions: An action that can be performed promptly to restore a non-functional component to functional status (e.g., resetting a breaker), or to place a component in a desired configuration (e.g., open a valve), and which does not require work planning or implementation of lockout/tagout controls to complete.

Rescue Operations and First Aid: The tasks of locating missing personnel, removing them from hazardous areas, if needed, and providing necessary initial medical treatment. Personnel performing initial medical treatment should be trained to the level of Red Cross Basic First Aid, or otherwise meet minimum State and/or local standards for providing such assistance.

## 3.2 INSTRUCTIONS

### 3.2.1 Complete Appendix A, DBT and DBA Events.

1. The Design Basis Threat (DBT) is already entered in the table and does not require a separate entry; however, the site-specific Reference Document(s) should be listed (i.e., the document describing the DBT).
2. Enter each Design Basis Accident (DBA) for which an analysis has been performed as described in the site’s FSAR, as updated. For each DBA, provide:

- a. A summary description of the event (e.g., “Loss of Coolant Accident”). [Column 3]
  - b. The plant mode stipulated by the DBA initial conditions. [Column 4] If none is stipulated, assume that all site units are in Mode 1, Power Operations.
  - c. The associated reference document(s) describing the DBT or DBA event and analysis (e.g., “UFSAR section 15.2.2”). [Column 5]
  - d. The Emergency Classification Level (ECL) that would be declared in accordance with the site emergency classification procedure. If no emergency would be declared, enter “None”. [Column 6]
  - e. Determination if a staffing analysis is required. [Column 7]
    - 1) Enter “Yes” if the event requires an emergency declaration per the site emergency classification procedure. Otherwise, enter “No”.
3. Attach additional pages as necessary; maintain the “Event #” sequential numbering for each DBA.
- 3.2.2 For each event identified in Appendix A, complete an analysis of on-shift staffing adequacy using Appendix B, Collateral Duty Identification Analysis, by performing the following steps.
1. Enter the applicable “Event #” from Appendix A for which the CDIA is being performed. This number will be entered on each page of Appendix B.
  2. Complete Table 1, On-Shift Positions, by performing the following steps.
    - a. Enter each On-shift Position in column 2, On-shift Position.

**NOTE**

For security personnel, list only those security positions relied upon to perform an emergency plan/response function. For example, if one Security Officer is assigned as a shift communicator and another Security Officer performs accountability, then list only those two individuals in Table 1.

**NOTE**

If some crews have two individuals filling the Shift Manager and Shift Technical Advisor roles, and other crews have a dual-role individual, the analysis should be performed using the dual-role individual.

For position titles with more than one position holder, assign a unique sequential number to each position. For example, a site with two units and two Reactor

Operators per unit would enter Reactor Operator #1, Reactor Operator #2, Reactor Operator #3 and Reactor Operator #4.

- b. Enter the Basis Document that contains the requirement for the position to be on-shift in column 3, Basis Document. If more than one, enter all basis documents that apply to this position.
  - c. For the on-shift positions listed below, enter the elapsed time, in minutes, from the emergency declaration until the position is relieved of the function/task or supplemented by additional staff from the augmented ERO in column 4, Augmentation Elapsed Time. This should be the time(s) described in, or derived from, the site emergency plan (e.g., 30 minutes, 60 minutes, 90 minutes, etc.).
    - Radiation Protection Technician
    - Chemistry Technician
  - d. Attach additional pages as necessary. Maintain the sequential line numbering for each position.
  - e. Using only the On-shift Positions listed in Table 1, complete Tables 2 through 5 by entering the on-shift position that fills a described role, or performs a specific function or task. Follow the instructions presented below for each Table.
3. Complete Table 2, Plant Operations & Safe Shutdown, by performing the following steps.
- a. Identify the operations staffing matrix which aligns with the site unit and control room configuration (i.e., number of units and control rooms), and enter the applicable site unit(s) number next to the selected staffing matrix.
    - Sites with 3 or more units should use the combination of existing tables, or create a table, that best reflects their site configuration.
  - b. For each generic title/role listed in the selected matrix, enter the corresponding On-shift Position from Table 1. Position definition is provided below.
    - 1) The Unit Supervisor is the SRO that provides direction to Reactor Operators during implementation of AOPs, EOPs, etc.
    - 2) For On-shift Positions with multiple members, include the unique sequential number in each block. For example, a single unit site with three on-shift reactor operators would list Reactor Operator #1 and Reactor Operator #2 in the respective blocks of Table 2. This leaves Reactor Operator #3 available for assignment to another role/function.

- 3) List the Auxiliary Operators (AOs) who are required to perform the in-plant (manual) operator actions necessary to achieve safe shutdown of the unit<sup>4</sup>. In other words, these are the AOs who must be available (dedicated) to perform safe shutdown actions, and thus can have no other assigned functions. [This role is typically filled by a non-licensed operator but may be filled by a licensed operator in some scenarios.] Similar to the above bullet, if a single unit site has 5 AOs on-shift, list AO #1 and AO #2 in the respective blocks of Table 2. This leaves three (3) AOs available for assignment to another role/function.
  - c. Enter additional licensed or non-licensed operator(s) in the spaces provided if they are required to achieve the safe shutdown of all affected units (e.g., must perform an action necessary to implement an Emergency Operating Procedure).
  - d. In Table 1, locate each On-Shift Position assigned to Table 2. For each position, enter "Table 2" and the associated line number in column 5 of Table 1 (Role in Table#/Line#).
4. Complete Table 3, Firefighting, by performing the following steps.
  - a. If the DBA being assessed does not include a fire, enter "N/A" in all blocks; continue to step 4.2.2.5.
  - b. Enter the five (5) On-Shift Positions (from Table 1) that comprise the Fire Brigade.
  - c. In Table 1, locate each On-Shift Position assigned to Table 3. For each position, enter "Table 3" and the associated line number in column 5 of Table 1 (Role in Table#/Line#).
5. Complete Table 4, Radiation Protection & Chemistry, by performing the following steps.

**NOTE**

The Radiation Protection (RP) functions/tasks presented in this table are those performed by RP technicians. Do not include non-RP Technician personnel who are qualified to perform one of these functions or tasks. For example, an Auxiliary Operator qualified to perform self-job coverage should not be included.

- a. Review applicable response procedures to identify RP or Chemistry-related functions or tasks that must be performed during the period prior to the arrival of the augmenting ERO (i.e., during the time period denoted in Table 1, column 4). Procedures to be reviewed include AOPs, EOPs, radiation protection, chemistry and emergency plan.

---

<sup>4</sup> This is typically the minimum Auxiliary Operator complement required by the unit's Technical Specifications.

- b. In column 2, enter the On-shift Position (from Table 1) which performs the listed Function/Task required by a procedure.
    - “Offsite Radiological Assessment” refers to the task of performing offsite dose projections in response to a radiological release to the environment<sup>5</sup>. If the DBA does not result in a radiological release, or this function is not performed by a Radiation Protection or Chemistry Technician, then enter “N/A” in this block.
    - Attach additional sheets as necessary.
  - c. Based on operating experience (e.g., drills, real events, etc.), timed performance and/or informed judgment, enter an “X” in each column representing the five (5) minute time increments following the emergency declaration during which the function or task would be performed. Attach supporting information to explain the basis for these time estimates.
  - d. In Table 1, locate each On-Shift Position assigned to Table 4. For each position, enter “Table 4” and the associated line number in column 5 of Table 1 (Role in Table#/Line#).
6. Complete Table 5, Emergency Plan Implementation, by performing the following steps.
- a. In column 3, enter the On-shift Position (from Table 1) which performs the listed Function/Task required by an emergency plan implementing procedure.

**NOTE**

In some cases, licensee procedures may allow for more than one individual to perform a given function/task (e.g., a primary and a backup). For analysis purposes, assume that the “primary” individual performs the function/task.

- 1) Line 1 - “Declare the Emergency Classification Level (ECL)” refers to the task of the Shift Manager declaring the emergency.
- 2) Line 2 - “Approve Offsite Protective Action Recommendations” refers to the task of the Shift Manager approving PARs for transmittal to offsite authorities.
- 3) Line 3 - “Approve content of State/local notifications” refers to the task of the Shift Manager approving emergency-related information for transmittal to offsite authorities.
- 4) Line 4 - “Approve extension to allowable dose limits” refers to the task of the Shift Manager approving increases to emergency worker dose limits.

<sup>5</sup> The analysis should use the definition of a release specified in the site emergency plan or implementing procedures.

- 5) Line 5 - "Notification and direction to on-shift staff" refers to the task of determining appropriate instructions to provide to plant personnel (e.g., assemble, evacuate, etc.).
- 6) Line 6 - "ERO Notification" refers to the task of initiating/performing the callout of the ERO during a backshift, weekend or holiday. Examples include activating pagers, activating a callout system or service, etc.
- 7) Line 7 - "Complete State/local notification form"; self-explanatory. This should be the position which would receive NRC Drill/Exercise Performance (DEP) indicator credit for completing the offsite notification form.
- 8) Line 8 - "Perform State/local notifications" refers to the task of placing a telephone call, fax, web form transmittal, etc. which provides initial event notification to offsite authorities.
- 9) Line 9 - "Complete NRC event notification form"; self-explanatory.
- 10) Line 10 - "Activate ERDS"; self-explanatory.
- 11) Line 11 - "Offsite radiological assessment" refers to the task of performing offsite dose projections in response to a radiological release to the environment. If the DBA under analysis does not result in a radiological release, or if the assessment is performed by a Radiation Protection or Chemistry Technician (as indicated in Table 4), then enter "N/A" in this block.
- 12) Line 12 - "Perform NRC notifications" refers to the task of placing a telephone call which provides initial event notification to the NRC.
- 13) Line 13 - "Perform other site-specific event notifications (e.g., INPO, ANI, etc.)"; self-explanatory. Enter "N/A" if no additional, procedurally driven notification is required, if the notification can be completed within approximately 1 minute, or if it can be deferred until the arrival of the augmenting ERO.
- 14) Line 14 - "Personnel Accountability" refers to the function of generating the initial accountability report. For a DBA, this is required within 30 minutes of a Site Area Emergency or General Emergency although some sites may have this requirement at the Alert level. If the emergency classification level for the DBA does not result in the initiation of the personnel accountability function, then enter "N/A" in this block.
- 15) Line 15 - "Other: Specify". Include any additional site-specific roles, functions or tasks necessary to implement the emergency plan if performance duration exceeds approximately 1 minute.

- b. In Table 1, locate each On-Shift Position assigned to Table 5. For each position, enter “Table 5” and the associated line number in column 5 of Table 1 (Role in Table#/Line#).

3.2.3 When Tables 2 through 5 have been completed for a DBA or DBT event, perform an assessment of the results.

1. Review Table 1 to identify the On-shift Positions which have no or one assigned role, function or task, as denoted in column 5. These positions do not have any collateral duty which could detract from the performance of an emergency response function; therefore, no further analysis is required for these positions.
  - a. Enter “No” in column 6 (TTA Required?) for each position.
2. Review Table 1 to identify the On-Shift Positions which are assigned an emergency plan implementing function or task (from Table 5).
  - a. Using the guidance in the following table, enter “Yes” or “No” in column 6 (TTA Required?) for each position.

| Assigned E-Plan Role, Function or Task (from Table 5)                            | On-Shift Position |  |                                    |   |
|--|-------------------|--|------------------------------------|---|
|  | Shift Manager     | For any position <u>not</u> listed in Table 2, 3 or 4 <sup>6</sup> | For any position listed in Table 2 | For any position listed in Table 3 or 4 |
| Declare the Emergency Classification Level (ECL)*                                | No                |  |                                    |   |
| Approve Offsite Protective Action Recommendations*                               | No                |  |                                    |   |
| Approve content of State/local notifications*                                    | No                |  |                                    |   |
| Approve extension to allowable dose limits*                                      | No                |  |                                    |   |
| Notification and direction to on-shift staff (e.g., to assemble, evacuate, etc.) | No                | No   | No                                 | Yes                                     |
| ERO Notification   | Yes               | No   | Yes                                | Yes                                     |

<sup>6</sup> Based on industry experience/practice, it is assumed that the listed emergency plan implementing tasks, with the exception of Offsite Radiological Assessment, are performed sequentially. Performance of the listed tasks is routinely reviewed and evaluated in emergency response drills and exercises.

| Assigned E-Plan Role, Function or Task (from Table 5)                   | On-Shift Position |  |                                    |   |
|---|-------------------|--|------------------------------------|---|
|   | Shift Manager     | For any position <u>not</u> listed in Table 2, 3 or 4 <sup>6</sup> | For any position listed in Table 2 | For any position listed in Table 3 or 4 |
| Complete State/local notification form                                  | No                | No   | Yes                                | Yes                                     |
| Perform State/local notifications                                       | Yes               | No   | Yes                                | Yes                                     |
| Complete NRC event notification form                                    | No                | No   | Yes                                | Yes                                     |
| Activate ERDS   | No                | No   | No                                 | Yes                                     |
| Offsite radiological assessment   | Yes               | Yes <sup>7</sup>   | Yes                                | Yes                                     |
| Perform NRC notifications   | Yes               | No   | Yes                                | Yes                                     |
| Perform other site-specific event notifications (e.g., INPO, ANI, etc.) | Yes               | No   | Yes                                | Yes                                     |
| Personnel Accountability  | Yes               | No   | Yes                                | Yes                                     |
| Other   | Yes               | No   | Yes                                | Yes                                     |

3. The Shift Manager may be assigned the role of Shift Technical Advisor (STA)<sup>8</sup>; enter “No” in column 6 (TTA Required?) of Table 1 if the Shift Manager is assigned the role of STA.
4. Review Table 4 to identify time periods requiring the concurrent performance of two or more functions or tasks by the same on-shift position.
  - a. For the on-shift positions not required to perform two or more functions or tasks concurrently, enter “No” in column 6 of Table 1 (TTA Required?).
  - b. For the on-shift positions that are required to perform two or more functions or tasks concurrently, enter “Yes” in column 6 of Table 1 (TTA Required?).
5. Enter “Yes” in column 6 of Table 1 (TTA Required?) for all other positions.
6. Perform the required TTA for each position per Section 4.0.

<sup>7</sup> If this function is performed by a individual with no other assigned functions/tasks, then enter “No”.

<sup>8</sup> This is an acceptable collateral duty assignment per Generic Letter 86-04, Policy Statement on Engineering Expertise On-shift

7. If there are no “Yes” entries in Table 1, column 6, the on-shift staffing is adequate to respond to this event and no further action is required.

## **4 TIME TASK ANALYSIS PROCESS**

For the purposes of this guideline, an ERO job is defined as a group of EP related functions that are assigned to a single position. Functions can be associated with and grouped by planning standard. See Appendix C for a table of ERO performance functions and example descriptions for onsite personnel.

Responsibilities, or tasks, are elements that compose the process to accomplish a particular function. An ERO position may be assigned one or more responsibilities to accomplish a function, or multiple responsibilities may be assigned to several ERO positions to accomplish a particular function. The below outline illustrates the hierarchy:

A. Planning Standard – any of the §50.47(b) EP planning standards.

1. Function – the component that defines the program element used to accomplish the planning standard.

1.1. Responsibility (task) – the activity that describes the action or work performed to accomplish (or support the accomplishment of) a function.

1.1.1. Action step – the detailed actions performed to accomplish the task.

An ERO job that consists of interrelated functions and responsibilities that do not conflict would be coherent. An example of conflicting functions and responsibilities would be a RP Technician who is assigned to perform state and local event notification and in-plant radiation surveys. In this case, the RP Tech assigned to notifications and surveys, on Appendix B Table 1 On-Shift Position RP #1 in column 5 would be assigned two roles Table 4 Line 2 and Table 5 Line 8. Because these are not collateral duties allowed automatically by the Table in Step 3.2.3.2.a, “TTA Required” was checked in column 6 of Appendix B, Table 1. Because “TTA Required” was checked yes the evaluator is now referred to Section 4 for further evaluation.

A task analysis is the identification of requirements for accomplishing a particular responsibility and is typically used to determine initial and continuing training. Within the context of this guideline, the task analysis results are used to identify issues of timing, workload, etc. to determine resource conflicts that would affect the ability to accomplish a function and thus impact staffing assignments.

For certain responsibilities, it is possible for an ERO position to perform some overlapping tasks without experiencing overload. This is frequently the case for personnel within an operating center such as the Control Room, Technical Support Center and Emergency Operations Facility. For other positions, task overlap cannot be accommodated. This occurs when tasks must be performed in isolated areas or outside of the plant.

### **4.1 PROCESS ASSUMPTIONS**

4.1.1 Concept of operations (Ops on-shift organization) for minimum shift RO and SRO requirements specified in §50.54(m)(2)(I) will not be altered. Functions and

responsibilities assigned to licensed operators listed in Appendix B, Collateral Duty Identification Analysis, Table 2, Plant Operations & Safe Shutdown, other than for the Shift Manager position, will be limited to current plant status and corrective action bounded by EOP/AOP instruction.

- 4.1.2 The functions and responsibilities will be organized by planning standard as described in NUREG-0654 and will be used as the standard for defining the emergency performance requirements of the on-shift organization.
- 4.1.3 On-shift work activities analysis is performed up to the time where ERO responders are expected to arrive as specified in the approved Emergency Plan. No credit is taken for earlier response and relief.

## **4.2 PROCESS OUTLINE**

### **4.2.1 Function/Responsibility (Task) Analysis**

Using the event analysis results developed in Section 3 that identified positions with collateral / multiple responsibilities that may overlap assigned to their position (tasks that resulted in Column 6 of Appendix B Table 1 being checked yes for TTA Required), perform a function / responsibility (task) analysis to document the steps required to perform each of the functions.

- A. For each position assigned multiple responsibilities in an event scenario record the following on Appendix D, Function/Responsibility (Task) Analysis Template table:
  - Event type from Appendix A.
  - On-shift position and line # from Appendix B, Table 1.
  - Applicable overlapping functions and their associated responsibilities (tasks).
- B. Determine and list all of the action steps needed to perform the responsibilities (tasks) from implementing procedures or other instructional sources. Add additional rows for task's action steps as needed.
- C. Document the time it takes to perform the step. Step time (or duration) can be determined through direct performance observation such as in a drill or exercise that simulates the conditions under which the task is performed.

### **4.2.2 Work Activities Analysis**

Appendix E or a similar chronological timeline is used to record the work activities analysis information.

- A. Develop an event scenario timeline and narrative out to the time the position would be relieved of the responsibilities for the task.

This scenario should be documented in a manner similar to a drill/exercise package and include a description of the methods used to perform and observe the accomplishment of the task actions.

Level of detail should include defining whether the simulation starts in another location, travel time to the location where the activity is accomplished, delay time to acquire a procedure or get clearance to enter an area, environmental conditions likely to be present when the activity is performed (low visibility due to smoke, heat, lower levels of lighting for LOPs, etc.)

Documentation of the scenario should be similar to an extent of play description included in many utility exercise scenario manuals. The level of documentation for the scenario is determined by station processes and could be subject to NRC review.

NOTE: It may be useful to include a reference to a procedure or instruction in the column used to record the task / action step description.

- B. Run the scenario in an appropriate setting (walkthrough, simulator session, drill, etc.) and record the time, event condition and action performed for each task being analyzed.
- C. Determine whether there is an overlap of task steps that would preclude or impact the ability or timeliness to perform the actions.

#### 4.2.3 Personnel Requirements (Staffing Plan) Analysis

- A. Evaluate the results of the work activities analysis for overlap of concurrent task activity steps performed by single on-shift positions.
- B. If an overlap or other conflict is identified, the issue must be documented within the station corrective action process, evaluated and addressed.

Dispositioning may include further task analysis to justify why the overlap of actions is not a concern or an impact on the ability of personnel to perform important actions. For example; if an action step to notify state and local agencies of an event overlapped with the action steps to develop a broadcast message for non-ERO utility personnel, the actions of the non-critical responsibility could be moved to a later period in the procedure to eliminate the overlap. Refer to Appendix F for difficulty and importance definitions specific to EP tasks SAT analyses that may be used to assist in the dispositioning of overlapping responsibilities.

If an overlap of responsibilities cannot be justified or eliminated by reassignment to an existing on-shift position (that would not create a new overlap), then the conclusion of insufficient on-shift staff is the final assessment result.

## **5 REFERENCES**

- 5.1 10 CFR § 50.54 CONDITIONS OF LICENSES – SECTION (M)**
- 5.2 NUREG/CR-3903, ANALYSIS OF EMERGENCY STAFFING FOR NUCLEAR POWER PLANTS**
- 5.3 NUREG-0654, CRITERIA FOR PREPARATION AND EVALUATION OF RADIOLOGICAL EMERGENCY RESPONSE PLANS AND PREPAREDNESS IN SUPPORT OF NUCLEAR POWER PLANTS**
- 5.4 NUREG-0800, STANDARD REVIEW PLAN FOR THE REVIEW OF SAFETY ANALYSIS REPORTS FOR NUCLEAR POWER PLANTS**
- 5.5 NUREG-1852, DEMONSTRATING THE FEASIBILITY AND RELIABILITY OF OPERATOR MANUAL ACTIONS IN RESPONSE TO FIRE**
- 5.6 NRC INFORMATION NOTICE 91-77, SHIFT STAFFING AT NUCLEAR POWER PLANTS**
- 5.7 NRC INFORMATION NOTICE 93-81, IMPLEMENTATION OF ENGINEERING EXPERTISE ON-SHIFT**
- 5.8 NRC INFORMATION NOTICE 95-48, RESULTS OF SHIFT STAFFING STUDY**
- 5.9 INPO SIGNIFICANT OPERATING EXPERIENCE REPORT 96-1, CONTROL ROOM SUPERVISION, OPERATIONAL DECISION-MAKING, AND TEAMWORK**

**APPENDIX A**

**DBT and DBA Events**

| Event # | Event Type | Summary Description of Event   | Plant Mode | Reference Document(s) | Event ECL           | Analysis Required? |
|---------|------------|--|------------|-----------------------|---------------------|--------------------|
| 1       | DBT        | Land and/or waterborne HOSTILE ACTION directed against the Protected Area by a HOSTILE FORCE. Assume adversary characteristics defined by the Design Basis Threat (DBT). | 1          |                       | Site Area Emergency | Yes                |
| 2       | DBA        |  |            |                       |                     |                    |
| 3       | DBA        |  |            |                       |                     |                    |
| 4       | DBA        |  |            |                       |                     |                    |
| 5       | DBA        |  |            |                       |                     |                    |
| 6       | DBA        |  |            |                       |                     |                    |
| 7       | DBA        |  |            |                       |                     |                    |
| 8       | DBA        |  |            |                       |                     |                    |
| 9       | DBA        |  |            |                       |                     |                    |
| 10      | DBA        |  |            |                       |                     |                    |

[THIS PAGE IS LEFT BLANK INTENTIONALLY]

**APPENDIX B**

**Collateral Duty Identification Analysis**

*Complete this appendix by following the instructions in section 3.2.2.*

This CDIA is applicable to Event # \_\_\_\_\_ as identified in Appendix A.

**TABLE 1 – On-shift Positions**

| <b>Line</b> | <b>On-shift Position</b> | <b>Basis Document</b> | <b>Augmentation Elapsed Time (min)</b> | <b>Role in Table#/Line#</b> | <b>TTA Required?</b> |
|-------------|--------------------------|-----------------------|--|-----------------------------|----------------------|
| 1.          |                          |                       |  |                             |                      |
| 2.          |                          |                       |  |                             |                      |
| 3.          |                          |                       |  |                             |                      |
| 4.          |                          |                       |  |                             |                      |
| 5.          |                          |                       |  |                             |                      |
| 6.          |                          |                       |  |                             |                      |
| 7.          |                          |                       |  |                             |                      |
| 8.          |                          |                       |  |                             |                      |
| 9.          |                          |                       |  |                             |                      |
| 10.         |                          |                       |  |                             |                      |
| 11.         |                          |                       |  |                             |                      |
| 12.         |                          |                       |  |                             |                      |
| 13.         |                          |                       |  |                             |                      |
| 14.         |                          |                       |  |                             |                      |

**Collateral Duty Identification Analysis**

**TABLE 1 – On-shift Positions (continued)**

Event # \_\_\_\_\_

| <b>Line</b> | <b>On-shift Position</b> | <b>Basis Document</b> | <b>Augmentation Elapsed Time (min)</b> | <b>Role in Table#/Line#</b> | <b>TTA Required?</b> |
|-------------|--------------------------|-----------------------|--|-----------------------------|----------------------|
| 15.         |                          |                       |  |                             |                      |
| 16.         |                          |                       |  |                             |                      |
| 17.         |                          |                       |  |                             |                      |
| 18.         |                          |                       |  |                             |                      |
| 19.         |                          |                       |  |                             |                      |
| 20.         |                          |                       |  |                             |                      |
| 21.         |                          |                       |  |                             |                      |
| 22.         |                          |                       |  |                             |                      |
| 23.         |                          |                       |  |                             |                      |
| 24.         |                          |                       |  |                             |                      |
| 25.         |                          |                       |  |                             |                      |
| 26.         |                          |                       |  |                             |                      |
| 27.         |                          |                       |  |                             |                      |
| 28.         |                          |                       |  |                             |                      |

**Collateral Duty Identification Analysis**

**TABLE 2 – Plant Operations & Safe Shutdown**

Event # \_\_\_\_\_

**One Unit - One Control Room**

Applicable to site unit(s) # \_\_\_\_\_

| <b>Line</b> | <b>Generic Title/Role</b>      | <b>On-Shift Position</b> |
|-------------|--------------------------------|--------------------------|
| 1           | Shift Manager                  |                          |
| 2           | Unit Supervisor                |                          |
| 3           | Shift Technical Advisor        |                          |
| 4           | Reactor Operator #1            |                          |
| 5           | Reactor Operator #2            |                          |
| 6           | Auxiliary Operator #1          |                          |
| 7           | Auxiliary Operator #2          |                          |
| 8           | Other needed for Safe Shutdown |                          |
| 9           | Other needed for Safe Shutdown |                          |
| 10          | Other needed for Safe Shutdown |                          |

**Two Units - One Control Room**

Applicable to site unit(s) # \_\_\_\_\_

| <b>Line</b> | <b>Generic Title/Role</b>      | <b>On-Shift Position</b> |
|-------------|--------------------------------|--------------------------|
| 11          | Shift Manager                  |                          |
| 12          | Unit Supervisor                |                          |
| 13          | Shift Technical Advisor        |                          |
| 14          | Reactor Operator #1            |                          |
| 15          | Reactor Operator #2            |                          |
| 16          | Reactor Operator #3            |                          |
| 17          | Auxiliary Operator #1          |                          |
| 18          | Auxiliary Operator #2          |                          |
| 19          | Auxiliary Operator #3          |                          |
| 20          | Other needed for Safe Shutdown |                          |
| 21          | Other needed for Safe Shutdown |                          |
| 22          | Other needed for Safe Shutdown |                          |

**Collateral Duty Identification Analysis**

**TABLE 2 – Plant Operations & Safe Shutdown (continued)**      Event # \_\_\_\_\_

**Two Units - Two Control Rooms**                      Applicable to site unit(s) # \_\_\_\_\_

| <b>Line</b> | <b>Generic Title/Role</b>      | <b>On-Shift Position</b> |
|-------------|--------------------------------|--------------------------|
| 23          | Shift Manager                  |                          |
| 24          | Unit Supervisor #1             |                          |
| 25          | Unit Supervisor #2             |                          |
| 26          | Shift Technical Advisor        |                          |
| 27          | Reactor Operator #1            |                          |
| 28          | Reactor Operator #2            |                          |
| 29          | Reactor Operator #3            |                          |
| 30          | Reactor Operator #4            |                          |
| 31          | Auxiliary Operator #1          |                          |
| 32          | Auxiliary Operator #2          |                          |
| 33          | Auxiliary Operator #3          |                          |
| 34          | Auxiliary Operator #4          |                          |
| 35          | Other needed for Safe Shutdown |                          |
| 36          | Other needed for Safe Shutdown |                          |
| 37          | Other needed for Safe Shutdown |                          |
| 38          | Other needed for Safe Shutdown |                          |

### Collateral Duty Identification Analysis

**TABLE 3 – Firefighting**

Event # \_\_\_\_\_

| <b>Line</b> | <b>Performed By</b> |
|-------------|---------------------|
| 1           |                     |
| 2           |                     |
| 3           |                     |
| 4           |                     |
| 5           |                     |

### Collateral Duty Identification Analysis

**TABLE 4 – Radiation Protection & Chemistry**

Event # \_\_\_\_\_

| Line | Position Performing Function/Task                            | Performance Time Period After Emergency Declaration (minutes) |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|------|--|---|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|      |  | 0-5   | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 | 50-55 | 55-60 | 60-65 | 65-70 | 70-75 | 75-80 | 80-85 | 85-90 |
| 1    | In-Plant Survey<br>On-Shift Position:                        |   |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 2    | On-Site Survey<br>On-Shift Position:                         |   |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 3    | Personnel Monitoring<br>On-Shift Position:                   |   |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 4    | Job Coverage<br>On-Shift Position:                           |   |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 5    | Offsite Radiological Assessment<br>On-Shift Position:        |   |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 6    | Other Site-Specific RP – Describe:<br>On-Shift Position:     |   |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 7    | Chemistry function/task #1 – Describe:<br>On-Shift Position: |   |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 8    | Chemistry function/task #2 – Describe:<br>On-Shift Position: |   |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |

**Collateral Duty Identification Analysis**

**TABLE 5 – Emergency Plan Implementation**

Event # \_\_\_\_\_

| <b>Line</b> | <b>Function/Task</b>                               | <b>On-Shift Position</b> |
|-------------|--|--------------------------|
| 1           | Declare the Emergency Classification Level (ECL)*  | Shift Manager            |
| 2           | Approve Offsite Protective Action Recommendations* | Shift Manager            |
| 3           | Approve content of State/local notifications*      | Shift Manager            |
| 4           | Approve extension to allowable dose limits*        | Shift Manager            |

\* Shift Manager non-delegable duty

| <b>Line</b> | <b>Function/Task</b>   | <b>On-Shift Position</b>                |
|-------------|--|---|
| 5           | Notification and direction to on-shift staff (e.g., to assemble, evacuate, etc.) |   |
| 6           | ERO Notification   |   |
| 7           | Complete State/local notification form   |   |
| 8           | Perform State/local notifications  |   |
| 9           | Complete NRC event notification form   |   |
| 10          | Activate ERDS  |   |
| 11          | Offsite radiological assessment  | No entry required if entered on Table 4 |
| 12          | Perform NRC notifications  |   |
| 13          | Perform other site-specific event notifications (e.g., INPO, ANI, etc.)          |   |
| 14          | Personnel Accountability   |   |
| 15          | Other: Specify   |   |

**[THIS PAGE IS LEFT BLANK INTENTIONALLY]**

## APPENDIX C

### ERO Function List (by Planning Standard)

- A) Assignment of Responsibility (Organization Control): §50.47(b)(1)**
    - 1) Coordination with Offsite Response Agencies (EM, ICP, Field Mon, etc.)
    - 2) Continuous Staffing and Shift Relief
  - B) Onsite Emergency Organization: §50.47(b)(2)**
    - 1) Plant Operations (status monitoring and EOP actions)
    - 2) Command and Control
    - 3) Facility/Group Management and Supervision
    - 4) ERO Mobilization and Response (persons receiving the notification)
    - 5) Use of Medical, Fire and Law Enforcement Support
  - C) Emergency Response Support and Resources: §50.47(b)(3)**
    - 1) Request, Integration and Use of Offsite Personnel within the ERFs
    - 2) Dispatch and Control of Offsite EOC Liaisons
    - 3) Contact and Use of External Support Services (technical, material, etc.)
  - D) Emergency Classification System: §50.47(b)(4)**
    - 1) Event Classification
  - E) Notification Methods and Procedures: §50.47(b)(5)**
    - 1) ERO Notification
    - 2) Local/State Event Notification (ECL and PAR)
    - 3) NRC Event Notification
    - 4) Other Plan Specific Event Notification (INPO, ANI, etc.)
    - 5) Siren Activation/EAS Message Development
  - F) Emergency Communications: §50.47(b)(6)**
    - 1) Emergency Communications Systems
    - 2) NRC Emergency Telecommunications System
    - 3) Inter-Facility Communications
    - 4) Inter-Agency/Organization Communications
  - G) Public Education and Information: §50.47(b)(7)**
    - 1) Media Statements
    - 2) Media Briefings
    - 3) Accommodation of News Media Personnel
    - 4) Media Monitoring
    - 5) Rumor Control
  - H) Emergency Facility and Equipment: §50.47(b)(8)**
    - 1) Facility/Work Area Setup
    - 2) Facility Activation
    - 3) Facility Operation
    - 4) Facility Relocation
    - 5) Facility Information Display Systems
  - I) Accident Assessment: §50.47(b)(9)**
    - 1) Accident Detection and Assessment
      - a) Engineering analysis
      - b) Plant system prognosis
      - c) Priorities of mitigating actions
    - 2) Dose Assessment
      - a) Meteorological assessment
      - b) Release determination/projection
    - 3) Radiological Monitoring (inplant, onsite and offsite)
    - 4) Core Damage Assessment
    - 5) §50.54(x) and Severe Accident Management Guides
  - J) Protective Response: §50.47(b)(10)**
    - 1) Assembly and Accountability (onsite and/or offsite)
      - a) Search and rescue
    - 2) Evacuation (local area, protected area and OCA)
      - a) Precautionary dismissal
      - b) Site access controls
    - 3) Authorization and use of KI
    - 4) Offsite Protective Action Recommendations
    - 5) Habitability Controls
    - 6) Response Team Activities (damage assessment, repair, firefighting)
      - a) Task development and prioritization
      - b) Team briefing, dispatch and control
  - K) Radiological Exposure Control: §50.47(b)(11)**
    - 1) Authorization and use of Emergency Exposure Limits
    - 2) Monitoring and Decontamination (personnel, material, etc)
    - 3) Contamination Controls (site and personnel)
  - L) Medical and Public Health Support: §50.47(b)(12)**
    - 1) Transportation of Contaminated Injured Personnel
-

NEI 10-05 (Revision 0)  
November 2010

**M) Recovery Planning and Post-accident Operations: §50.47(b)(13)**

- 1) Event Termination
- 2) Initiation and Operation of the Recovery Organization
- 3) Environmental Sampling (ingestion pathway activities)

**Z) ERO Fundamentals**

- 1) Briefings and Updates
- 2) Log and Record Keeping
- 3) Post Event Facility/Work Area Restoration Activities

## **NUREG/CR-3903 On-shift Functions**

**Plant Operations** – activities performed or directed by licensed operators to stabilize the event and bring the reactor to a safe shutdown condition.

Current plant status: activities related to monitoring the status of the major reactor systems: the reactor core, the primary coolant boundary, the emergency core cooling system and the integrity of the containment building.

Corrective actions: all activities related to the execution of emergency operating procedures.

Damage assessment and repair: tasks necessary to identify damaged systems or components, put them back into operating condition, and verify the proper performance of corrective maintenance.

Firefighting: all activities needed to locate, contain and extinguish fires.

**Emergency Assessment** – diagnoses of past and present plant conditions and prognoses of future plant conditions that guide emergency personnel in their efforts to mitigate damage to the plant and prevent exposure to radiation.

Emergency classification: the comparison of key plant parameters or conditions to emergency action levels.

Engineering analysis: primarily the development of solutions to mechanical, electrical, instrumentation and control, and core physics/thermohydraulic problems. However, it also includes the diagnosis of the accident causes and the development of plans and procedures for corrective actions.

Plant systems prognosis: projection of the future status of the reactor core, primary coolant boundary, emergency core cooling system and containment integrity.

Source term projection/assessment: evaluation of the likely release fractions of various isotopes from the fuel and primary coolant system, as well as the time sequence of the releases. The source term assessment is based upon plant systems prognosis, radiochemical analysis and direct measurements of inplant radiation levels.

Radiochemical analysis: preparation and analysis of samples of reactor coolant, contaminant atmosphere, and stack or liquid effluents.

**Protective Response** – actions taken to prevent or minimize exposure of individuals to unnecessary hazards.

Radiological monitoring: dispatching of teams to any of three principal areas - inplant, onsite or offsite - and involves the measurement, recording and transmission of radiation survey data.

Meteorological assessment: collection of primary meteorological data, calculation of dispersion parameters, and the forecasting of future meteorological conditions.

Dose projection/assessment: calculation of dose rates from source term derived from one of three bases: (1) plant systems data (either current plant status or plant system prognosis), (2) inplant radiological information and effluent measurements, or (3) environmental samples. It also includes the projection of total (integral) dose over specified time frames.

Protective action recommendation: determination of the appropriate protective action for selected individuals onsite or offsite and the communication of the recommendation to the responsible authorities. The primary inplant protective actions involve use of respirators, radioprotective drugs, protective clothing, shielding, access control and evacuation. Offsite protective actions are primarily sheltering and evacuation.

Radiological exposure control: activities such as briefing of teams (e.g., exposure limits, routes of travel and stay times in radiation hazard areas), issuance of dosimetry and recording of exposures.

Search and rescue: locating missing or injured plant personnel, diagnosing any injuries, administering first aid, and transporting the victim to treatment facilities.

Decontamination: all activities required to remove surface contamination from exposed plant personnel.

Environmental sampling: dispatch of survey teams, collection of air, water or soil samples, the recording and transmission of environmental data and the analysis of samples collected. Analysis of environmental samples may be used to confirm dose assessments or to form the basis for offsite protective responses.

**Emergency Management** – activities by which the physical and human resources used to respond to the emergency are maintained and controlled to accomplish the goals of the emergency response effort.

Activation of emergency organizations: notification of required plant personnel onsite and off-duty as well as members of offsite emergency organizations.

Offsite coordination: communication of emergency conditions, analyses and actions to offsite organizations. These include the State and local operations centers and support facilities, corporate headquarters, industry support groups (e.g., NSSS vendor, A/E, INPO, ANI), and the NRC.

Onsite management: establishment and maintenance of communication and coordinated action among response teams performing plant operations, emergency assessment and protective response functions.

Accountability: establishment and maintenance of records of the location of all onsite personnel and establishment of the Identity and probable location of missing persons.

Security: restriction of access to the site or controlled areas within the site and control of the evacuation of nonessential personnel.

Documentation: recording of plant status and prognosis, corrective actions implemented, and protective actions recommended and implemented.

Administrative and logistic support: activities required to provide additional onsite personnel, material or equipment, or to request offsite firefighting, medical or security support.

Public information: periodic press releases and press conferences in coordination with local, state and federal response agencies.

Several NUREG/CR-3903 function descriptions involve multiple planning standards, and actually consist of several functions. A table correlating the NUREG/CR-3903 generalized on-shift functions with the NUREG-0654 planning standard categorized functions is provided below:

| <b>NUREG/CR-3903 function</b>         | <b>PS function</b>  | <b>Comments</b>                       |
|---------------------------------------|---------------------|---------------------------------------|
| <b>Plant Operations</b>               |                     |                                       |
| Current plant status                  | B.1                 |                                       |
| Corrective actions                    | B.1                 |                                       |
| Damage assessment and repair          | J.6                 |                                       |
| Firefighting                          | J.6                 |                                       |
| <b>Emergency Assessment</b>           |                     |                                       |
| Emergency classification              | D.1                 |                                       |
| Engineering analysis                  | I.1                 |                                       |
| Plant systems prognosis               | I.1                 |                                       |
| Source term projection/assessment     | I.4                 |                                       |
| Radiochemical analysis                | I.4                 | part of core damage assessment        |
| <b>Protective Response</b>            |                     |                                       |
| Radiological monitoring               | I.3                 |                                       |
| Meteorological assessment             | I.2                 | part of dose assessment               |
| Dose projection/assessment            | I.2                 |                                       |
| Protective action recommendation      | E.2, J.3, K.3 / J.4 |                                       |
| Radiological exposure control         | J.6                 | title not consistent with description |
| Search and rescue                     | J.1                 |                                       |
| Decontamination                       | K.2                 |                                       |
| Environmental sampling                | M.3                 |                                       |
| <b>Emergency Management</b>           |                     |                                       |
| Activation of emergency organizations | E.1, E.2, E.3       |                                       |
| Offsite coordination                  | C.1, E.4            |                                       |
| Onsite management                     | J.6                 | title not consistent with description |
| Accountability                        | J.1                 |                                       |
| Security                              | J.2                 |                                       |
| Documentation                         | Z.2                 | not a planning standard               |
| Administrative and logistic support   | B.2, C.4            |                                       |
| Public information                    | G.1, G.2            |                                       |

**[THIS PAGE IS LEFT BLANK INTENTIONALLY]**

**APPENDIX D**

**Function / Responsibility (Task) Analysis Template**

Event: \_\_\_\_\_

Position: \_\_\_\_\_

Line #: \_\_\_\_\_

| Function | Responsibility (Task) | Action Step | Duration |
|----------|-----------------------|-------------|----------|
| 1.       | 1.1                   | 1.1.1       |          |
|          |                       | 1.1.2       |          |
|          |                       | 1.1.3       |          |
|          | 1.2.                  | 1.2.1       |          |
|          |                       | 1.2.2       |          |
|          |                       | 1.2.3       |          |
|          | 1.3.                  | 1.3.1       |          |
|          |                       | 1.3.2       |          |
|          |                       | 1.3.3       |          |
| 2.       | 2.1                   | 2.1.1       |          |
|          |                       | 2.1.2       |          |
|          |                       | 2.1.3       |          |
|          | 2.2.                  | 2.2.1       |          |
|          |                       | 2.2.2       |          |
|          |                       | 2.2.3       |          |
|          | 2.3.                  | 2.3.1       |          |
|          |                       | 2.3.2       |          |
|          |                       | 2.3.3       |          |

[THIS PAGE IS LEFT BLANK INTENTIONALLY]



[THIS PAGE IS LEFT BLANK INTENTIONALLY]

## APPENDIX F

### EP Based Responsibility (task) ‘Difficulty’ and ‘Importance’ Rating Criteria

#### Difficulty ‘D’

The difficulty of a responsibility (task) is based on an average of the difficulty attribute values associated with the responsibility (task). Numeric ratings are established from the assumption that experience/proficiency levels are those of an individual newly qualified to the ERO.

Difficulty attributes and their values are as follows:

|                                | <b>5 points</b> | <b>3 points</b> | <b>1 point</b> |
|--------------------------------|-----------------|-----------------|----------------|
| <b>Complexity (# of steps)</b> | High            | Medium          | Low            |
| <b>Speed</b>                   | Fast            | Medium          | Slow           |
| <b>Duration</b>                | Long            | Medium          | Short          |
| <b>Distractions</b>            | Many            | Some            | Few            |
| <b>Locations</b>               | Many            | Some            | Single         |
| <b>Overlap</b>                 | Likely          | Possible        | Unlikely       |

Complexity – Complexity is established by assessing the intricacy or number of steps involved with the task.

Speed – Speed is established by assessing the pace at which the task must be performed, particularly in the case of time dependent activities, such as classification and notification.

Duration – Duration is established by assessing the time it takes to complete the task and whether it is repeated frequently.

Distractions – Distractions is established by assessing the environment where the task is performed in consideration of light, noise, nearby activity, interruption, etc.

Locations – Locations is established by assessing the number of locations it would take an individual to fully perform the task (not how many places the task could be performed from).

Overlap – Overlap is established by assessing the potential for the task to be performed at the same time that another task is being done. For example, Notification steps for a General Emergency typically overlap with steps to determine an initial PAR.

## **Importance 'I'**

The importance of a responsibility (task) relative to its emergency response functions or to the safety of the public / plant staff is based on a 1 through 5 point scale.

Considerations for determining the level of importance are based primarily on their relationship to a Planning Standard (PS) or Risk Significant Planning Standard (RSPS) and include the following:

High (5 points) – The responsibility (task) involves the accomplishment of a RSPS function and failure to perform the task would result in the failure of the RSPS function.

-OR-

Failure to accomplish the responsibility (task) correctly results in the immediate risk of death to anyone involved in the activity.

Medium High (4 points) – The task involves the accomplishment of a RSPS function, but failure to perform the task would not result in the failure of the RSPS function.

-OR-

Failure to accomplish the responsibility (task) correctly creates a personnel safety hazard capable of serious injury or risk to health.

Medium (3 points) – The responsibility (task) involves the accomplishment of a PS function and failure to perform the task would result in the failure of the PS function.

Medium Low (2 points) – The responsibility (task) involves the accomplishment of a PS function, but failure to perform the task would not result in the failure of the PS function.

Low (1 point) – The responsibility (task) does not involve the accomplishment of a RSPS or PS function.

- Note: The term Risk Significant Planning Standards refers to Planning Standards described in 10 CFR 50.47(b)(4), (5), (9) and (10), Appendix E, Section IV, B, C, D(1) and D(3).